

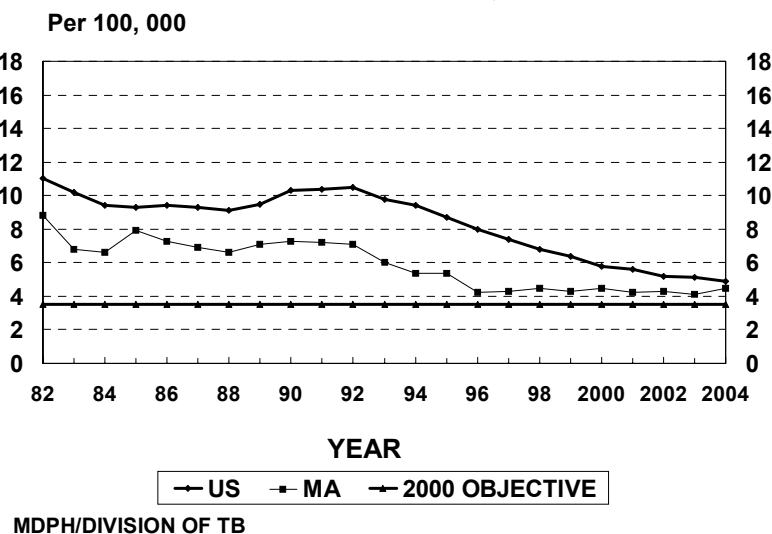
Massachusetts Department of Public Health
Bureau of Communicable Disease Control
Division of Tuberculosis Prevention and Control

2004 Tuberculosis Overview

EPIDEMIOLOGY

In 2004, 284 cases (case rate 4.47 per 100,000 population) of active tuberculosis (TB) were reported to and verified by the Massachusetts Department of Public Health, Division of TB Prevention and Control. Although this represents a 37% overall decline in the case rate since 1992, case rates have not gone down since 1996. Between 2003 and 2004, the case rate for TB increased by 9%.

United States and Massachusetts Tuberculosis Case Rates, 1982-2004



Note: Case rates are based on estimated population projected for each year. 1990 and 2000 case rates were calculated using 1990 and 2000 U.S census figures. All case rates are per 100,000 population.

Seventy percent of Massachusetts TB is reported from the 23 largest communities plus two communities of less than 50,000 population considered to be at higher risk of TB (Appendix 1). Although Boston continues to be the community with the highest incidence of TB (70 cases in 2004, case rate 11.88), the proportion of Massachusetts TB cases in Boston has declined since 1996 (1996-33%, 2000-29%, 2004-25%).

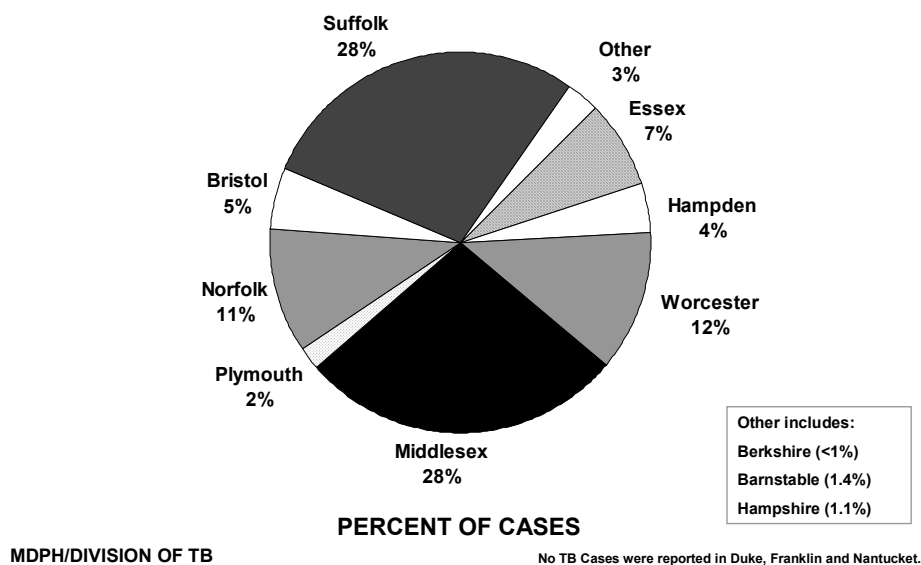
Of the 351 cities and towns in Massachusetts, 79(23%) reported TB cases. Of those, 10(13%) had five or more TB cases and the remaining 69 (87%)

communities had less than five cases (see Appendix 2).

By Community Health Network Area (CHNA), 6 CHNAs had 5 or more TB cases. CHNA 19 (City of Boston/Chelsea/Revere/Winthrop) had the largest proportion of TB cases in the state (29%). (See Appendix 3)

Analysis of TB cases by county of residence reveals that 56% of the cases were reported from two counties, Suffolk (28%), and Middlesex (28%), which is the largest county. Three counties Barnstable, Berkshire and Hampshire had less than two per cent of TB cases each. Dukes, Franklin and Nantucket counties reported no TB cases in 2004.

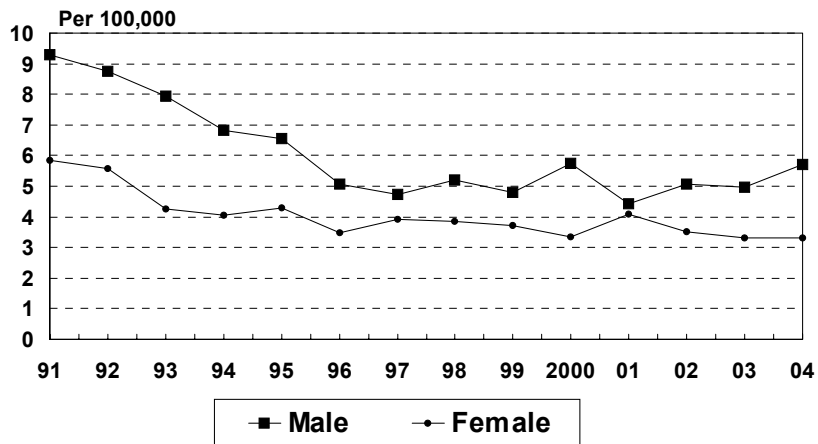
Verified Tuberculosis Cases by County MA, 2004 (N = 284)



2. Sex, Race and Age

Of the 284 TB cases, 175 (62%) were male and 109 (38%) were female. The case rate for both males and females declined between 1991 and 1996. Between 1996 and 2001, the case rate for both remained relatively stable. However, between 2001 and 2004, the case rate for males has increased while the case rate for females has remained stable. In 2004, the case rate for males was 5.72 per 100,000 and 3.31 for females.

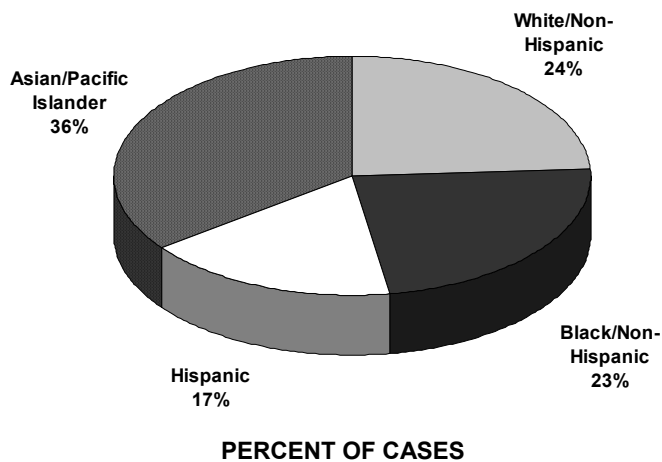
Tuberculosis Case Rates by Gender MA, 1991 - 2004



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The majority of the TB cases in 2004 occurred among persons in minority groups (215 cases, 76%): Black (65 cases 23%), Asian (101 cases, 36%), and Hispanic (48 cases, 17%), and American Indian (1 cases, <1%).

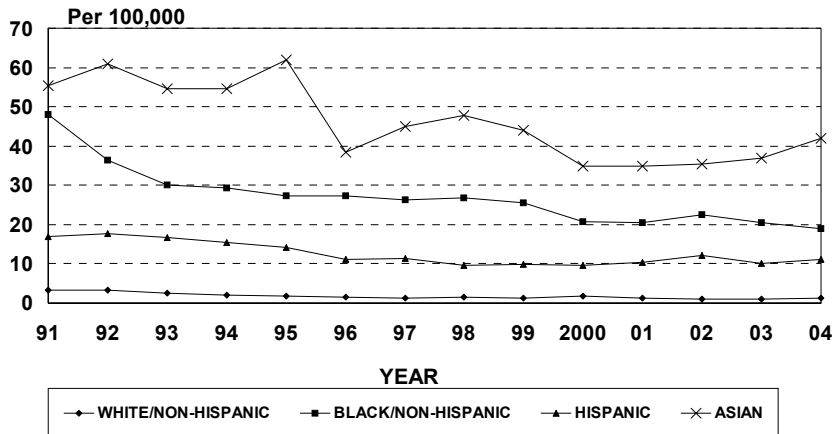
Tuberculosis Cases by Race/Ethnicity MA, 2004 (N=284)



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Case rate for Whites and Hispanics gradually declined between 1992-1996 and has since leveled off. For Blacks, the case rate has declined 61% from 48.13 in 1991 to 18.93 in 2004. Asians continue to have a much higher case rate than any other group (41.98 in 2004).

Tuberculosis Case Rates by Race/Ethnicity MA, 1991-2004



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Relative risks (RR) for TB disease for minority groups compared to White/ Non Hispanics groups are Black=14.67, Hispanic=8.68, Asian=32.54.

Tuberculosis Case Rates by Race/Ethnicity MA, 2004 (N=284)

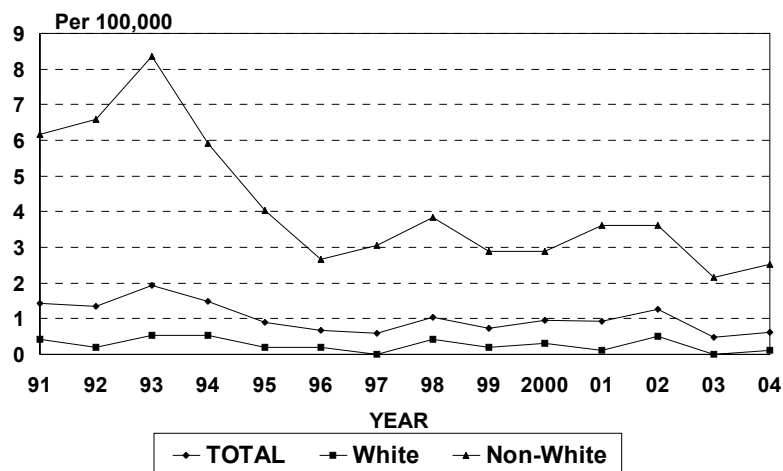
Race Ethnicity	#Cases	Case Rate	Relative Risk
White	69	1.29	1
Black/NH	65	18.93	14.67
Hispanic	48	11.20	8.68
Asian, P.I	101	41.98	32.54
American Indian/Alaska Native	1	6.66	5.16

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NH = Non-Hispanic

In 2004, 8 TB cases (3%) were in children < 15 years of age, of which seven (88%) were minorities. The case rate among minority children in 2004 was 2.53 per 100,000 population; an increase of 17% in comparison to case rate in 2003.

Tuberculosis in Children Age < 15 Years Case Rates By Race MA, 1991 - 2004



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Among TB cases reported in 2004, 46 cases (16%) were in persons less than 25 years old, 106 (37%) were between the ages of 25 – 44 years, 76 (27%) were between the ages of 45 – 64 years and 56 (20%) were age 65 years and older. Persons with TB who were members of minority groups tended to be younger than whites reported with TB. Among minority group members, more than half were younger than 45 years of age (Black 66%, Hispanic 71%, Asian 53%). Specifically, 91% of those less than 25 years of age and 84% of those ages 25 – 44 years were members of minority groups.

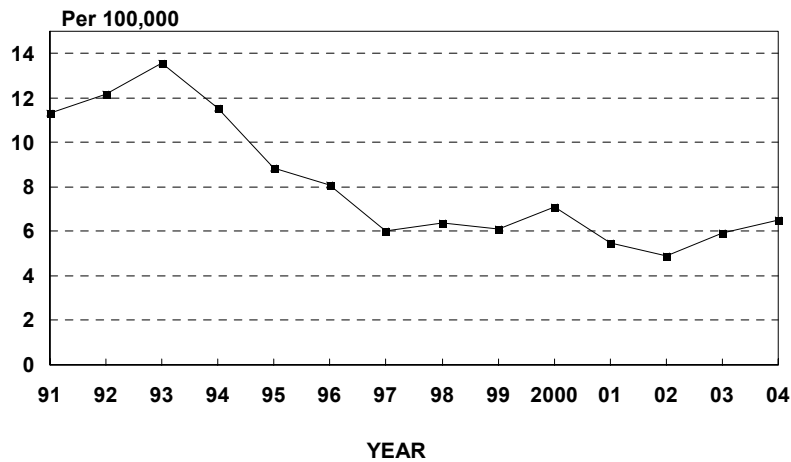
Tuberculosis Cases by Age, Race/Ethnicity MA, 2004 (N=284)

Age	White/NH	Black /NH	Hispanic	Asian	American Indian/Alaska Native	Total
≤25	4 (5.80)	21 (32.31)	15 (31.25)	6 (5.94)		46 (16.19)
25-44	17 (24.64)	22 (33.85)	19 (39.58)	48 (47.52)		106 (37.32)
45-64	22 (31.88)	16 (24.62)	10 (20.83)	27 (26.73)	1 (100%)	76 (26.76)
65+	26 (37.68)	6 (9.23)	4 (8.33)	20 (19.80)		56 (19.71)
Total	69	65	48	101	1	284

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In 2004, 56 (20%) TB cases were in persons age 65 years and older. Case rates for this group have declined significantly from 13.55 in 1993 to 6.93 in 2004.

Rate of Tuberculosis in Persons Age 65 and Over MA, 1991 - 2004



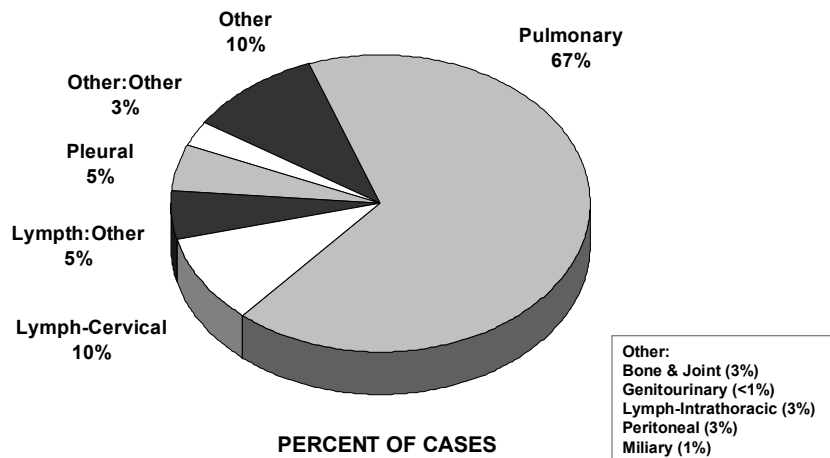
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Clinical Characteristics

Site of Disease

In 2004, 191 (67% of 284) of people with TB presented with lung as the primary site of disease. This was followed by cervical lymph node - 28 cases (10%), other lymphatic- 15 cases (5%), and pleural -14 cases (5%).

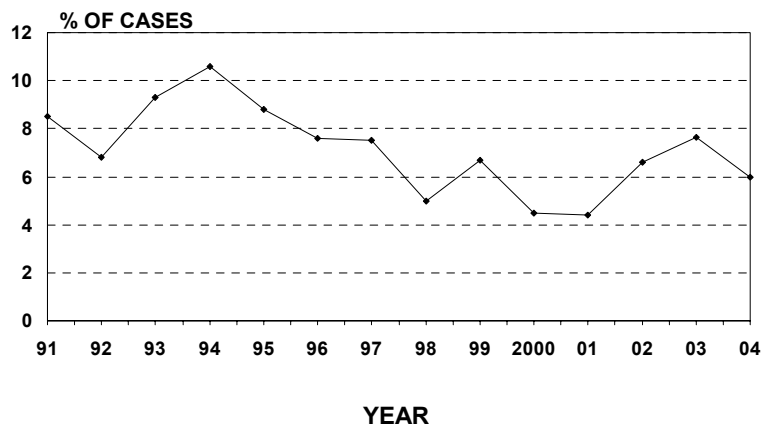
Tuberculosis Cases by Primary Disease Site MA, 2004 (N=284)



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In 2004, 17 TB cases (6%) had multiple sites of disease. The majority of these cases had pulmonary or pleural involvement.

Percent of Tuberculosis Cases with Multiple Sites MA, 1991 – 2004 (N = 284)

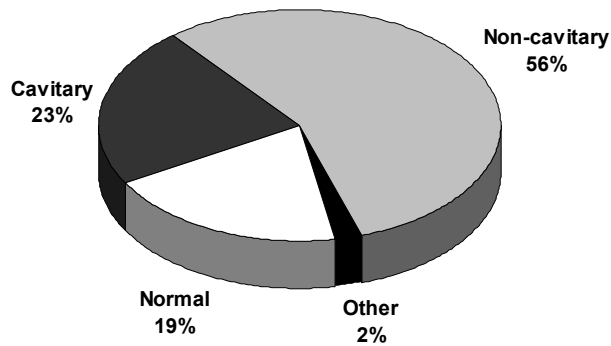


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Chest Radiography Results

Of the 284 cases of TB, 159 (56%) presented with non-cavitary pulmonary disease at time of diagnosis. Sixty-four cases (23%) presented with cavitary disease, 55 cases (19%) had a report of a normal chest x-ray.

Tuberculosis Cases by X-ray Results MA, 2004 (N=284)



PERCENT OF CASES

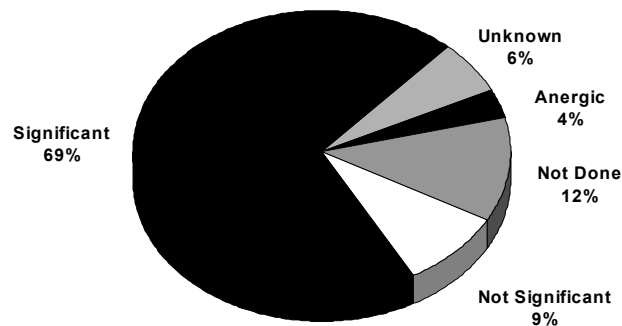
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Other Includes:
Non cavitary -not consistent with TB=5
Unknown=1

Skin Test Results

One-hundred-ninety-eight (69%) of the 284 cases of TB had positive skin test results, 10 cases (4%) were documented to be anergic, 25 cases (9%) had negative results, 17 cases (6%) had unknown results and 34 cases (12%) did not have skin testing done.

Tuberculosis Cases by Skin Test Results MA, 2004 (N=284)



PERCENT OF CASES

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Bacteriologic Confirmation

In 2004, 217 (76%) of the 284 TB cases were bacteriologically confirmed. This represents a bacteriologically substantiated incidence rate of 3.40 per 100,000 population. This rate of bacteriological confirmation is similar to that observed for the past several years.

Of the 217 bacteriologically confirmed cases, drug susceptibility tests were performed on isolates for 210 (97%) of the TB cases. Thirty-two (15%) of the 210 TB cases were found to have isolates resistant to anti-tuberculosis drugs. Twenty-four of these 32 cases (75% or 11% of 210 cases) had isolates resistant to isoniazid (INH), either alone or in combination with other agents. In 2004, there were 4 multi – drug resistant TB cases (defined as the isolate being resistant to at least INH and rifampin (RIF)).

Tuberculosis Drug Resistance MA, 2004

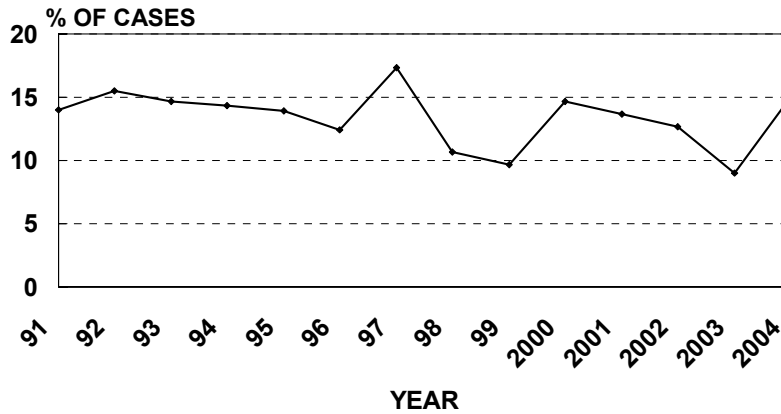
TB Cases (N=284)	N (%)
Bacteriologically Confirmed Cases*	217 (76%)
Confirmed Drug Resistant Cases**	32 (15%)
Resistant To Isoniazid (Alone or in Combination with Other)**	24 (11%)
Resistant to at least Isoniazid and Rifampin (MDR)	4 (2%)
* Bacteriologically substantiated Incidence of 3.40 per 100,000 population	
** Of bacteriologically confirmed cases	

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Note: drug resistance is defined as greater than 1 percent bacterial population resistance to any concentration of that drug. Multi-drug resistance is defined as resistance to isoniazid (INH) and rifampin (RIF), with or without any other resistance.

The proportion of cases resistant to anti-tuberculosis drugs increased from 9% in 2003 to 15% in 2004. Since 1991, however, the proportion of cases with drug resistant TB in Massachusetts continues to remain in the range of 10 -15% of the total bacteriologically confirmed TB cases.

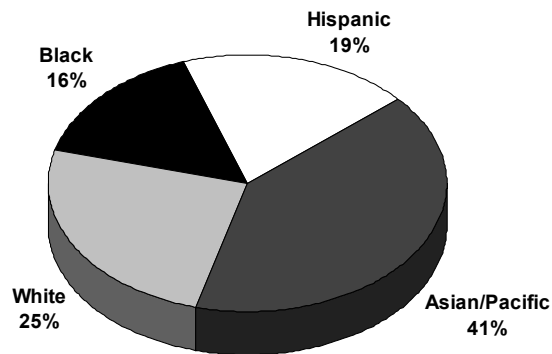
Percent of Bacteriologically Confirmed TB Cases With Drug Resistant Isolates, MA 1991 - 2004



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The majority of the drug resistant cases occurred among Asians 13 cases (41%). Whites accounted for 8 cases (25%), Blacks 5 cases (16%), and Hispanics 6 cases (19%).

Drug Resistant Tuberculosis Cases by Race/Ethnicity, MA 2004 (N=32)

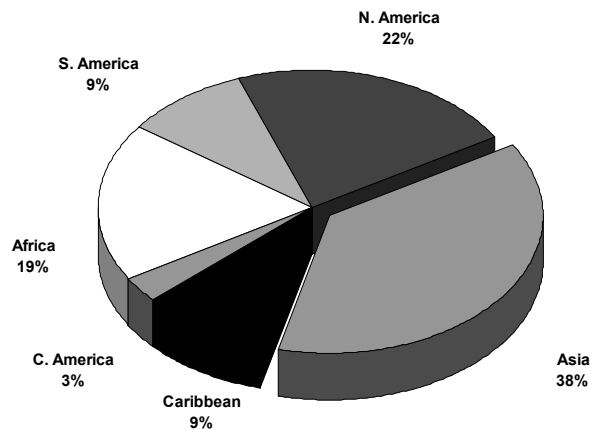


PERCENT

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Of the 32 drug resistant cases, 25 (78%) were individuals born outside the United States. Countries of origin included: Vietnam- 4 cases (13%), China- 3 cases (9%), Cape Verde- 3 cases (9%) and India- 3 cases (9%). The remaining 12 (48%) cases were from 9 different countries.

Drug Resistant Cases by World Region, MA, 2004 (N = 32)



PERCENT OF DRUG RESISTANT CASES

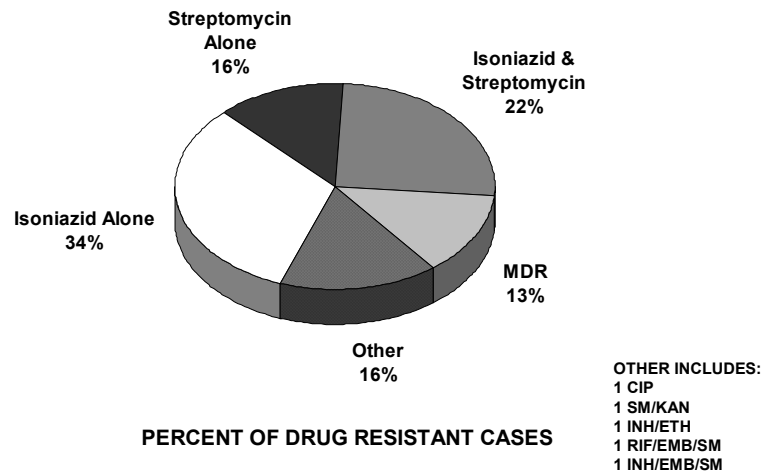
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32 DRUG RESISTANT TB CASES FROM 14 COUNTRIES.

Of the 32 TB cases with drug resistant disease, isolates from 11 cases (34%) were resistant to INH alone, 5 cases (16%) were resistant to streptomycin (SM) alone, and 7 cases (22%) were resistant to INH and SM. In 2004, there were four cases with multi-drug resistant TB (MDR-TB). The remaining five cases were resistant to:

- 1 Ciprofloxacin
- 1 Streptomycin/Kanamycin
- 1 Isoniazid /Ethionamide
- 1 Rifampin/Ethambutol/Streptomycin
- 1 Isoniazid /Ethambutol/Streptomycin

Tuberculosis Cases By Drug Resistance Pattern MA, 2004 (N = 32)



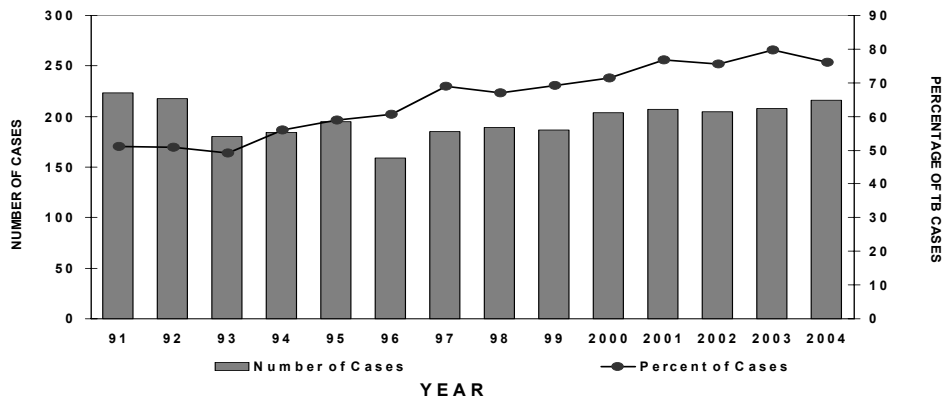
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Higher Risk Group Profile

Cases in Non-U.S. Born Persons

The non-U.S. born (defined as persons born outside the United States and its territories) remain the group at highest risk for TB disease in Massachusetts. In the year 2004, 216 (76%) of the TB cases occurred in persons not born in the U.S. Over the years, non-US born persons have accounted for an increasing proportion of the TB cases in Massachusetts from 35% in 1984 to 76% in 2004. While the proportion of cases occurring among the non-U.S. born has increased, the absolute number of such cases has been relatively stable since 2000.

Trends in TB Cases in Non-US Born Persons MA, 1991 - 2004

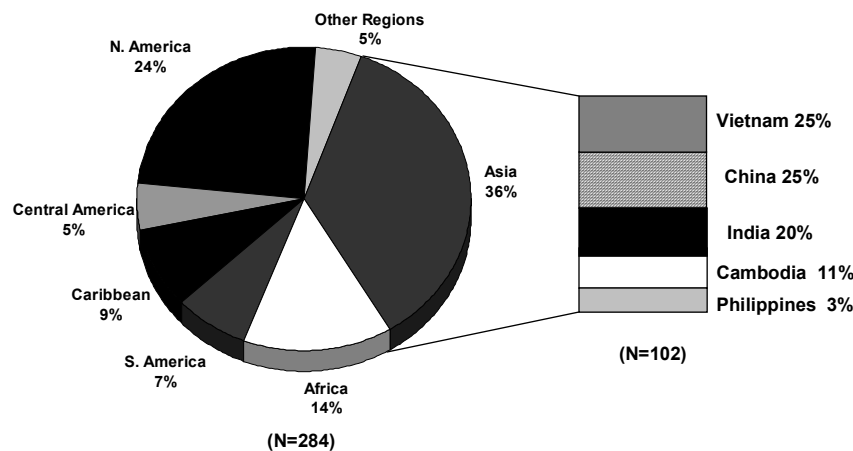


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Of the 216 non-U.S. born persons with TB in 2004, those from China and Vietnam each accounted for 12% of the cases (25 cases each) followed by India- 20 cases (9%), Haiti -16 cases (7%), Cambodia- 11 cases (5%), Cape Verde –8 cases (4%), Dominican Republic- 7 cases (3%), and Kenya- 6 cases (3%). The remaining 98 cases (45%) were from 50 different countries.

When non-U.S. born TB cases were analyzed by geographic region of birth, the largest proportion of cases was from Asia with 102 cases (47%), followed by Africa with 41 (19%), and the Caribbean with 25 cases (12%).

Tuberculosis Cases Place of Birth by World Regions MA, 2004 (N=284)



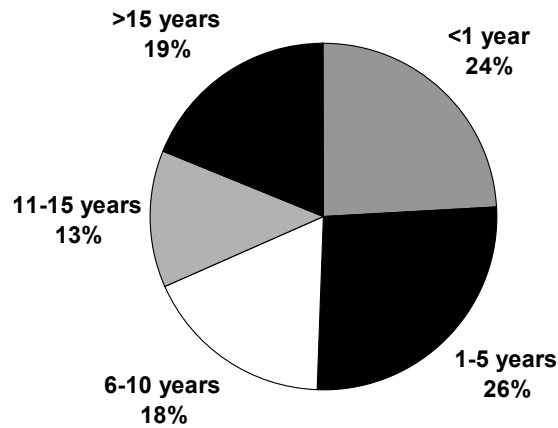
PERCENT OF CASES

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Between 1993 and 2004, a total of 2,321 TB cases in the non-U.S. born were reported in Massachusetts. Of those, 1,300 (56%) were from 7 countries that include: Vietnam - 323 cases (14%), Haiti - 273 cases (12%), China - 204 cases (9%), India - 196 cases (8%), Cambodia - 128 cases (6%), Dominican Republic- 101 cases (4%), Brazil - 75 cases (3%). The remaining 1,021 (44%) cases were from 107 different countries.

For many populations, the risk of developing TB disease is highest during the first few years after arrival to the US. Analysis of the 2,321 non-U.S. born TB cases indicates that 1,173 cases (50%) developed TB disease within 5 years of arriving in the U.S.

**Time Interval Between Arrival in the US and TB
Diagnosis Among Non-US Born Cases
1993 – 2004, (N=2,321)**

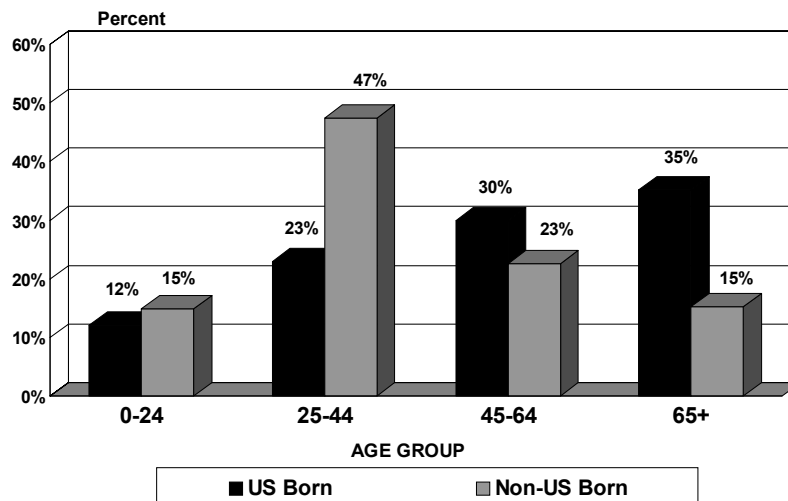


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Non-US Born vs. US born

Comparison of non-U.S born TB cases and U.S- born TB cases by age shows that non-U.S. born with TB were likely to be younger than those with TB born in the U.S. In particular, a greater proportion of non-U.S. born cases were between the ages of 25 – 44 years old (47% vs. 23%). A greater proportion of those age 65 years and older were U.S.-born (35% vs. 15%).

**Non-US Born and US Born Cases by
Age Group MA, 1993 - 2004**

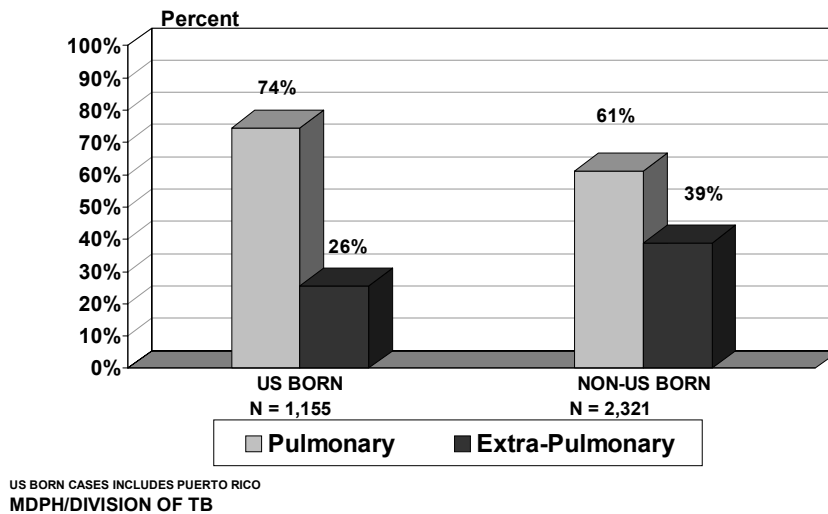


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US BORN CASES INCLUDING PUERTO RICO N=1,155
NON-US BORN CASES N=2,321

The US Born TB cases were more likely to have pulmonary disease than non-U.S born cases (74% vs. 61%).

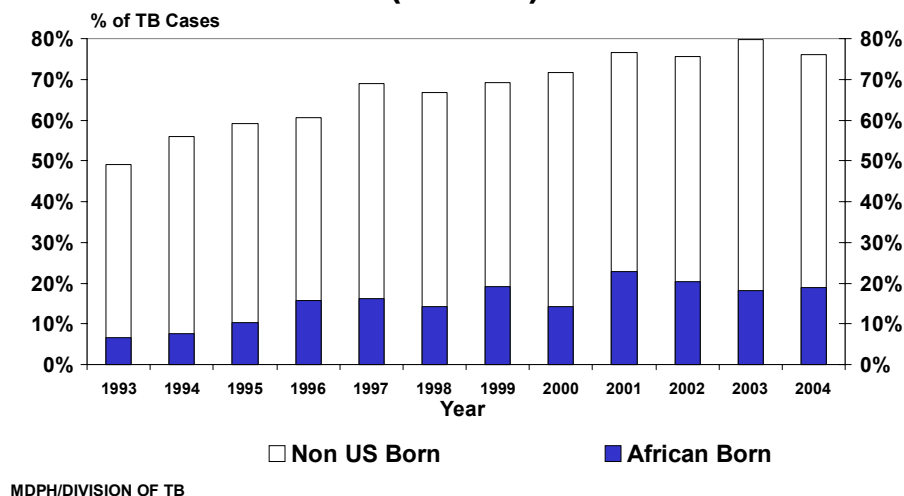
Non-US Born and US Born Cases by Site of Disease MA, 1993-2004



Tuberculosis in African Born Populations

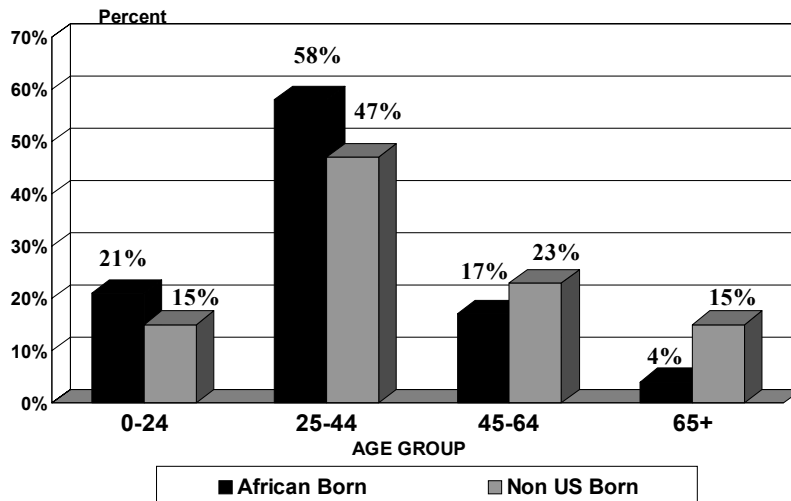
Among the non-U.S. born cases, the proportion of TB reported in those born in Africa steadily increased from 7% to 19% between 1993 and 2004. Within this period, a total of 361 TB cases (16% of all non-U.S. born persons) were in people born in Africa.

Percent of African Born TB Cases Among Non U.S Born, MA 1993-2004 (N=361)



Comparison of African born to non-U.S. born TB cases indicates that African born TB cases tended to be younger. Specifically, 58% of cases born in Africa were between 25 and 44 years of age compared to 47 % of the non-U.S born cases. Only 4% of the TB cases born in Africa were over 65 years of age compared to 21% among the non-U.S. born cases.

African Born and Non-US Born Cases by Age Group MA, 1993 – 2004 (N=361)

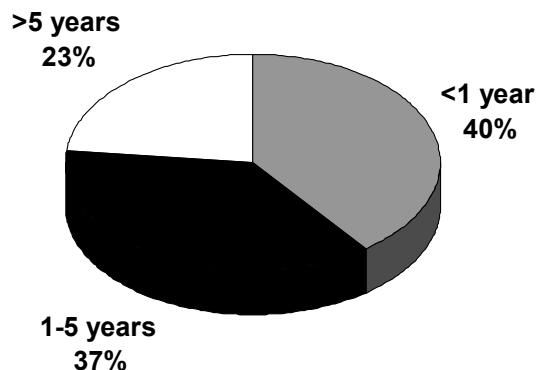


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US BORN CASES INCLUDING PUERTO RICO N=1,155
FOREIGN-BORN CASES N=2,321

Of the 361 TB cases born in Africa, 77% were diagnosed with TB within 5 years of arriving to the US. This is significantly higher than the percentage reported for all non-U.S. born in the same time interval (50%). (See page 14)

Time Interval Between Arrival in the US and TB Diagnosis Among Africa Born Cases 1993 – 2004, (N=361)



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6=Unknown

Cases in the Homeless Population

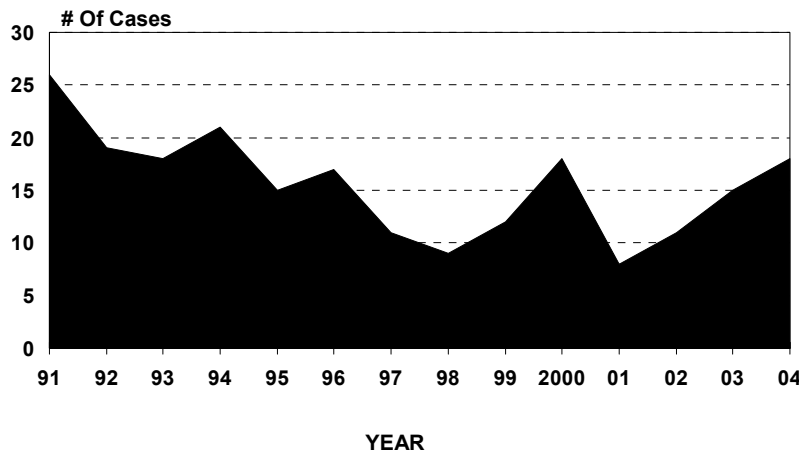
A homeless person is defined as a person who lacks a fixed, regular and adequate night time residence. This includes a person who resides in a shelter, welfare hotel, on the street, or in a single room occupancy hotel, and who is not paying rent, does not own a home and is not steadily living with relatives or friends.

Of the 284 cases of TB reported in 2004, 18 cases (6%, case rate 57.87 per 100,000) were reported to have been homeless. Among the 18 homeless cases, 10 (56%) were from the City of Boston.

Note: data reported prior to 1993 for homeless was limited to persons who were homeless at time of diagnosis. In 1993, the CDC revised the definition of homelessness to include persons who had been homeless within a year prior to diagnosis.

The 2000 census indicates that there are 6,210 homeless persons in the Boston. The Massachusetts Bureau of Health Statistics Research and Evaluation estimates that there are approximately 31,100 homeless persons statewide. Case rates were calculated based on these figures.

Tuberculosis Cases Among the Homeless MA, 1991 - 2004

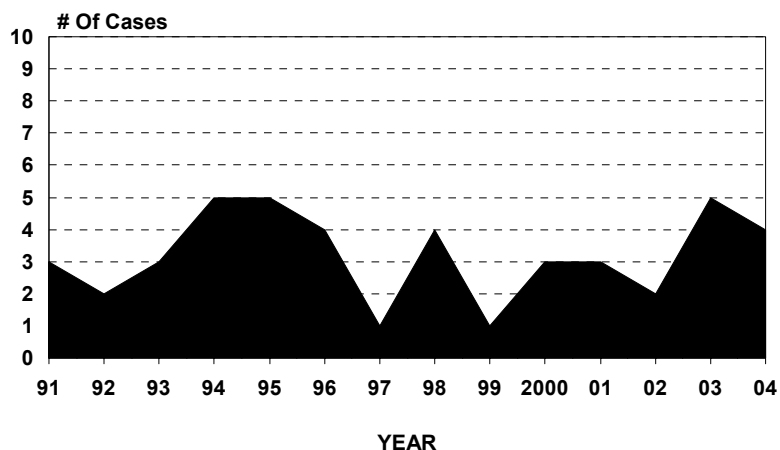


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Cases in Correctional Facilities

Between 1989 and 1991, an outbreak of TB occurred at a prison facility located in the southeastern part of the state. Following this outbreak, a massive screening and educational programs and routine screening of inmates was instituted at all the state prison facilities. Since 1991, few TB cases in MA were diagnosed within correctional settings. In 2004, 4 cases (1%) of TB were diagnosed in these facilities.

Tuberculosis Cases in Correctional Facilities MA, 1991 - 2004



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Cases in Long Term Care Facilities

In 2004, 8 cases (3%) of TB were reported in persons residing in long term care facilities at time of diagnosis- 5 cases in nursing homes and 3 in other residential facilities. Since 1992 there has been a gradual decline in TB cases diagnosed in such settings.

Tuberculosis Cases in Long Term Care Facilities MA, 1991 - 2004

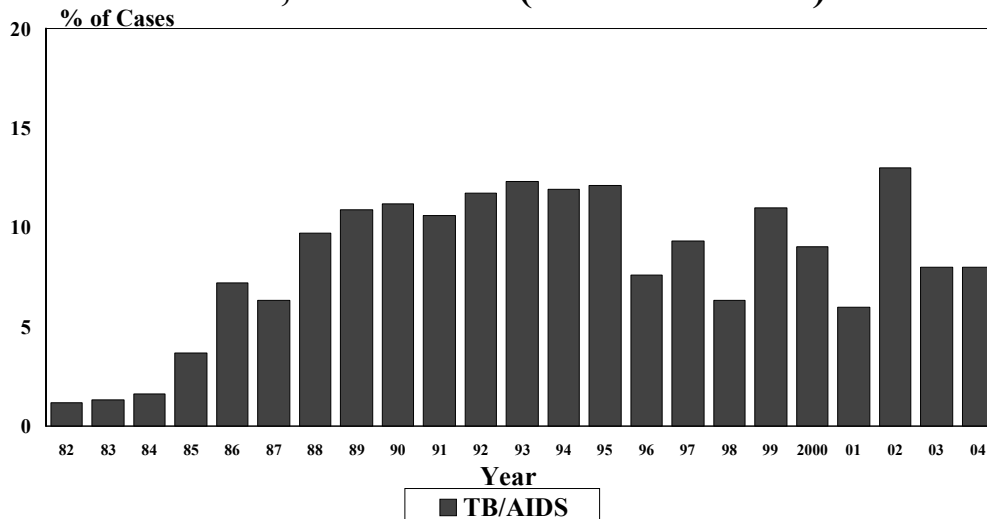


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TB/AIDS Cases

Match of the TB registry to the AIDS registry has taken place annually since 1992. In 1993, the AIDS case definition was revised to include anyone with HIV infection with TB disease at any site. Between 1982 and 2004, 665 TB/AIDS cases were identified. In 2004, 23 TB cases (8%) were co-infected with HIV.

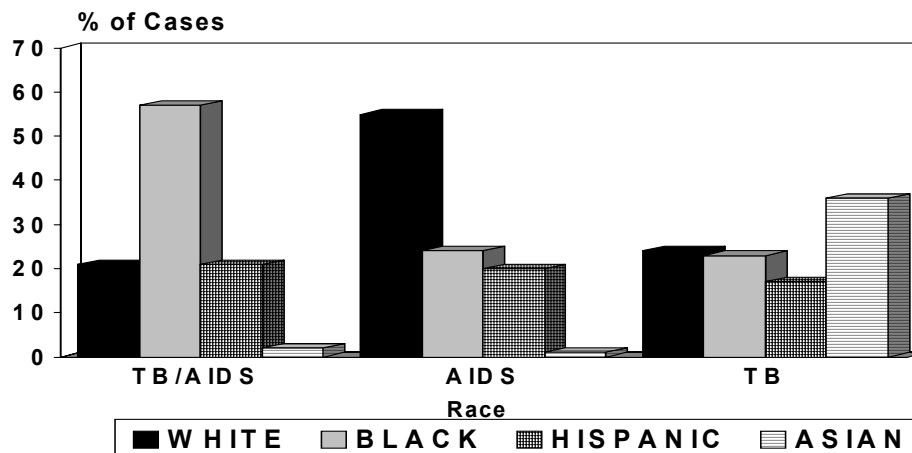
Percent of TB Cases Diagnosed with AIDS MA, 1982 - 2004 (TB/AIDS = 665)



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Minority group members accounted for the majority of the TB/AIDS cases (527 cases, 79%). When compared to the reported AIDS cases and TB cases, a greater proportion of TB/AIDS cases were Black (24% of AIDS and 23% of TB vs. 57% of TB/AIDS). Among TB/AIDS cases in Blacks, 66% were non-U.S. born and 34% were African American.

TB/AIDS, AIDS* and TB** Cases by Race MA, 1982 - 2004 (TB/AIDS = 665)

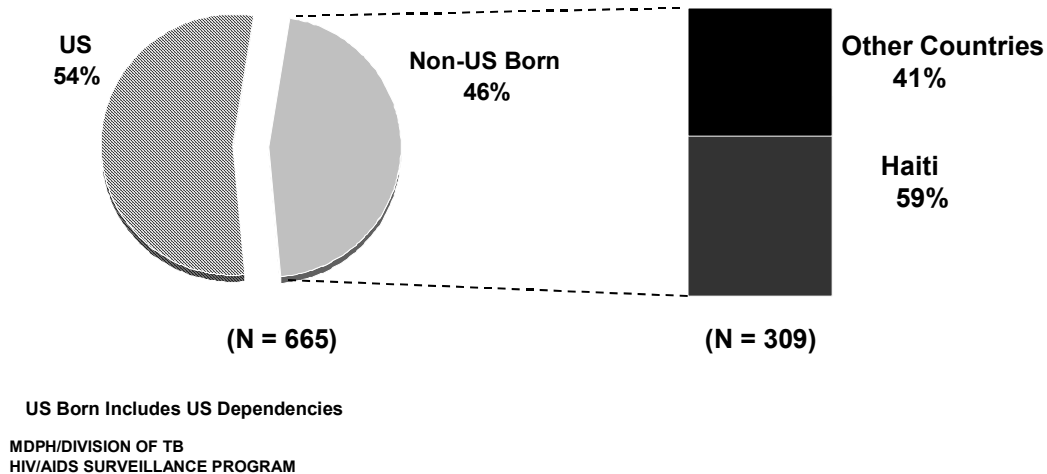


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*AIDS cases excludes those diagnosed with TB =18,325
**TB cases from 2004 =284

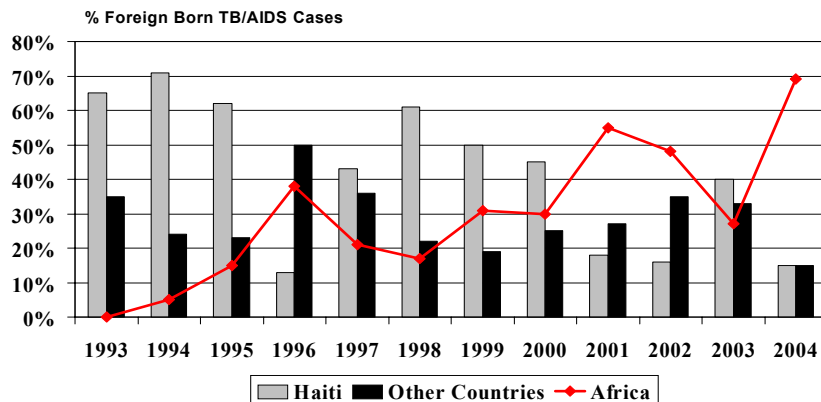
Of the 665 TB/AIDS cases reported between 1982 and 2004, 309 cases (46%) were persons born outside of the U.S. and its territories. The majority (59%) during this time period were born in Haiti.

TB/AIDS Cases by Place of Birth MA, 1982 – 2004 (N=665)



Analysis of 197 non-U.S. born TB/AIDS cases from a more recent time period (1993 to 2004), indicates that the proportion of those persons born in Africa has increased from 0% in 1993 to 69% in 2004. Conversely, the proportion of TB/AIDS cases born in Haiti has declined from 65% in 1993 to 15% in 2004.

TB/AIDS Cases by World Region 1993 – 2004 (N=197)

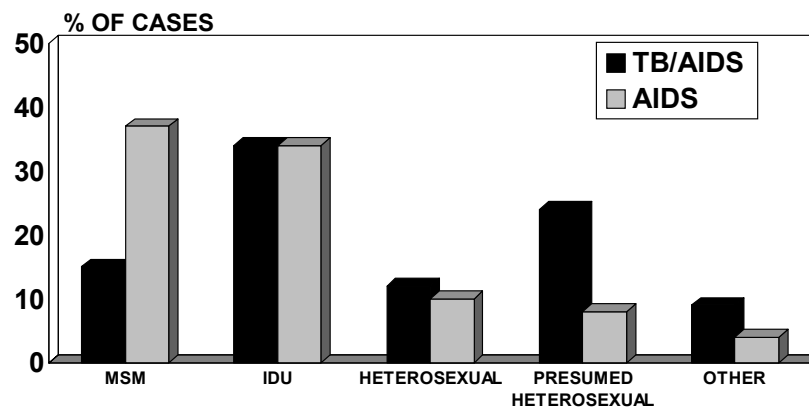


Analysis of TB disease site among TB/AIDS cases indicates that 317 (48%) had only pulmonary involvement, 229 cases (34%) had only extra-pulmonary disease and 119 cases (18%) had both pulmonary and extra-pulmonary involvement.

Analyses of TB/AIDS cases by HIV risk behavior indicate that, for TB/AIDS cases, the most common HIV risk is presumed heterosexual contact (225 cases, 34%) followed by injecting drug use (222 cases, 33%), and men who have sex with men (98 cases, 15%). Compared to AIDS cases, a greater proportion of TB/AIDS cases contracted HIV infection through presumed heterosexual contact (34% vs. 8%).

Note: Heterosexual risk is defined as sexual contact with someone of the opposite sex who is known to be HIV infected or to be at risk for HIV infection. Presumed heterosexual contact is defined as an individual with no reported risk who has sexual partners of unknown HIV or risk status.

TB/AIDS and AIDS* Cases by HIV Risk Behaviors MA, 1982 - 2004 (TB/AIDS = 665)

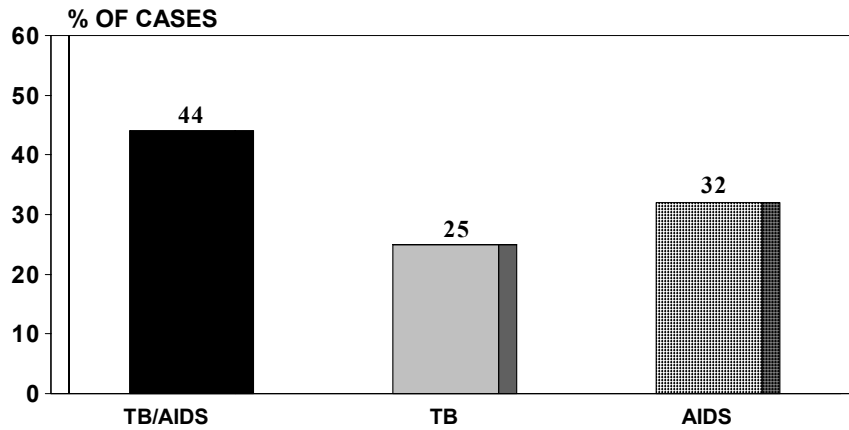


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IDU=Injection Drug Use
MSM=Male Sex with Male
*AIDS cases excludes those Diagnosed with TB

At time of AIDS diagnosis, 44% of the TB/AIDS cases resided in the City of Boston as compared to 25% of the TB cases and 32% of the AIDS cases.

**Proportion of Massachusetts TB/AIDS Cases
Residing* in Boston 1982 – 2004
(TB AIDS = 665)**



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*Residence at Time of AIDS Diagnosis